INTERNATIONAL DATA SCIENCES INC.

MANUAL OF OPERATION
FOR
MODEL 80
V.35 INTERFACE
BREAKOUT PANEL

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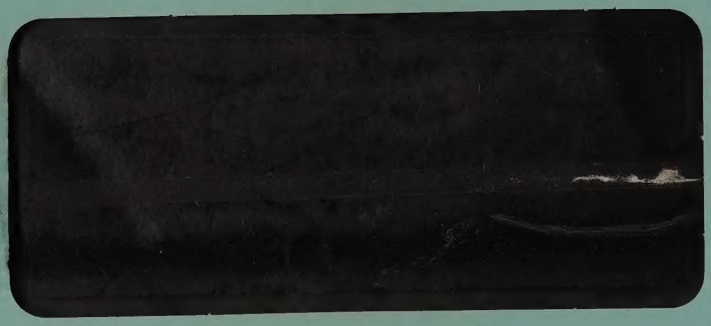

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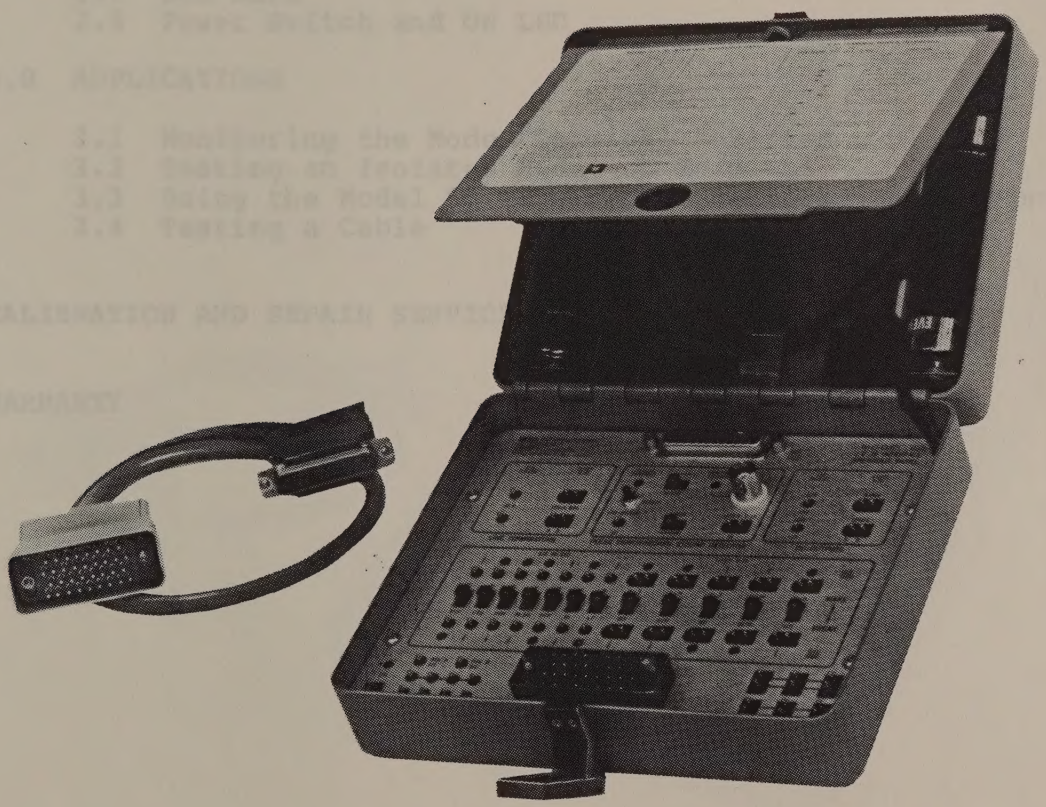

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1.0 INTRODUCTION

1.1 General

The Model 80, shown in Figure 1-1, is a portable hand-held instrument designed to monitor and breakout the standard 34-pin CCITT V.35 digital interface. Its use allows access to all interface signal conductors in order to isolate and solve modem-terminal problems. Interface signals can be re-routed by opening lines utilizing miniature switches and by cross-patching using miniature jumper cables. The jumper cables and an auxiliary interface cable, used to connect the Model 80 to the modem, are stored in a compartment inside the top cover. The Model 80 is housed in a sturdy case to provide years of reliable field service.

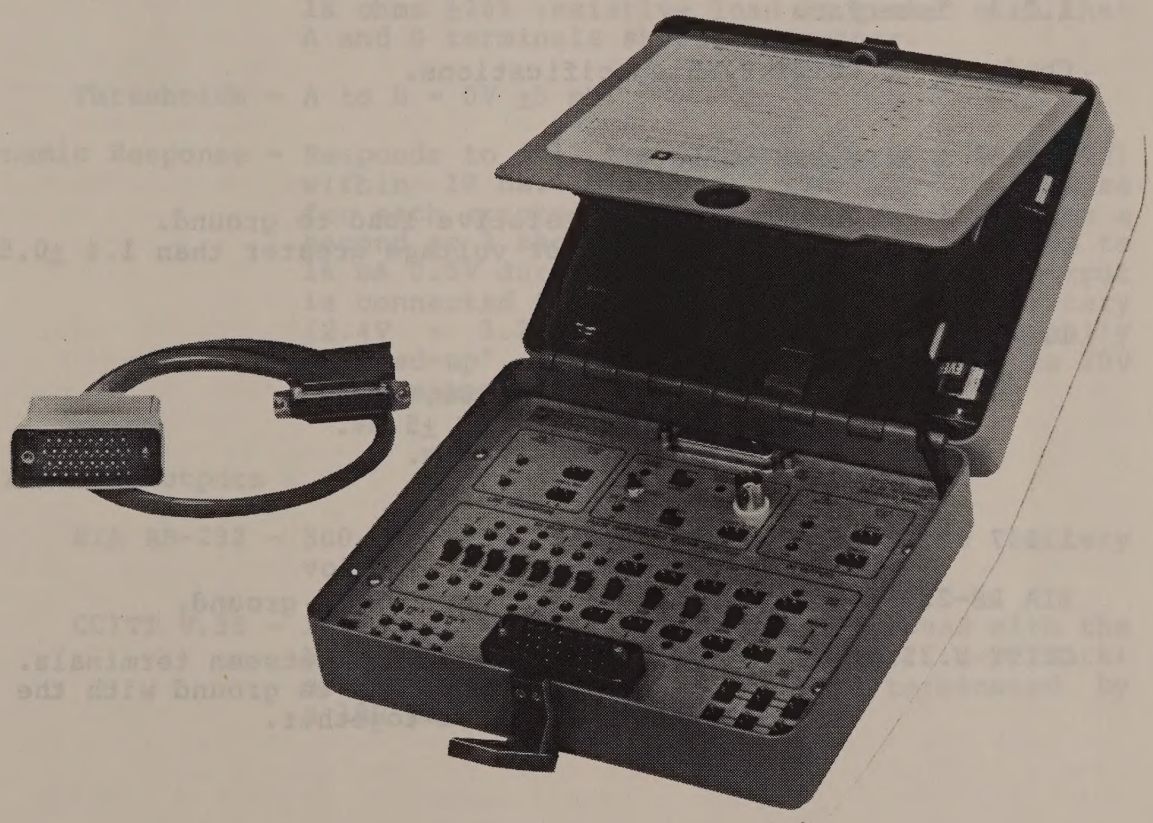

FIGURE 1-1. MODEL 80 V.35 INTERFACE BREAKOUT PANEL

1.2 Technical Specifications

1.2.1 Dimensions

Height: 6 inches (15.6 cm)
Width: 7 inches (17.8 cm)
Depth: 3 inches (7.6 cm)

1.2.2 Weight

The Model 80 weighs approximately 3 pounds (1.36 kg).

1.2.3 Power Source

Power is supplied by four (4) size C, 1.5 volt alkaline batteries (No. E93 or equivalent).

1.2.4 Interface

Conforms to CCITT V.35 specifications.

1.2.5 EIA RS-232 Sensors

Input Impedance - 27K ohms resistive load to ground.
Threshold - LED is ON for voltage greater than 1.4 ±0.5V.

1.2.6 CCITT V.35 Sensors

Input Impedance - 4K ohms ±10%.
Threshold - A to B = 0V ±5 mV.
Dynamic Response - DC to 100 KHz.

1.2.7 Line Terminators

EIA RS-232 - 3K ohms ±10% resistive load to ground.

CCITT V.35 - 100 ohms ±10% resistive load between terminals.
150 ohms ±10% resistive load to ground with the A and B terminals shorted together.

1.2.8 Pulse Trap/Errored-Second Detector

EIA RS-232

Input Impedance - 12K ohms ±10% resistive load to ground. 20 pF capacitive load to ground.

Thresholds - Any voltage between -2.0V and +2.0V nominal will cause the trap to be set.

Dynamic Response - Responds to full transitions through both thresholds independent of slew rate. Responds to marginal incursions (0.5V) through either threshold within 2 us.

CCITT V.35

Input Impedance - 4K ohms ±20% resistive load between terminals. 1K ohms ±20% resistive load to ground with the A and B terminals shorted together.

Thresholds - A to B = 0V ±5 mV.

Dynamic Response - Responds to full transitions (A-B or B-A=0.5V) within 10 us. 0.5 second ±30% TTL "low" pulse for each errored second. The circuit defines a second as 1 second +5%. Output will sink up to 16 mA 0.5V during pulse. Between pulses output is connected through 1K ohm to positive battery (2.4V - 3.2V). Output may be externally "pulled-up" resistively to any power up to 20V for greater pulse levels.

1.2.9 DC Outputs

EIA RS-232 - 300 ohms ±10% source impedance at the battery voltage (2.4V - 3.2V).

CCITT V.35 - 100 ohms ±5% resistive load to ground with the A and B terminals shorted together. A-B (Mark) or B-A (Space) = 0.55V ±20% when terminated by a 100 ohm resistive load.

1.3 Application Configuration

In use, the operator unplugs the V.35 interface cable at the modem and plugs it into the Model 80. Then, using the auxiliary cable stored inside the top cover, connect the Model 80 to the modem (see Figure 1-2). The Model 80 is transparent to the interface while it allows the operator to monitor the state of key signal conductors. Additional applications are described in Section 3.0.

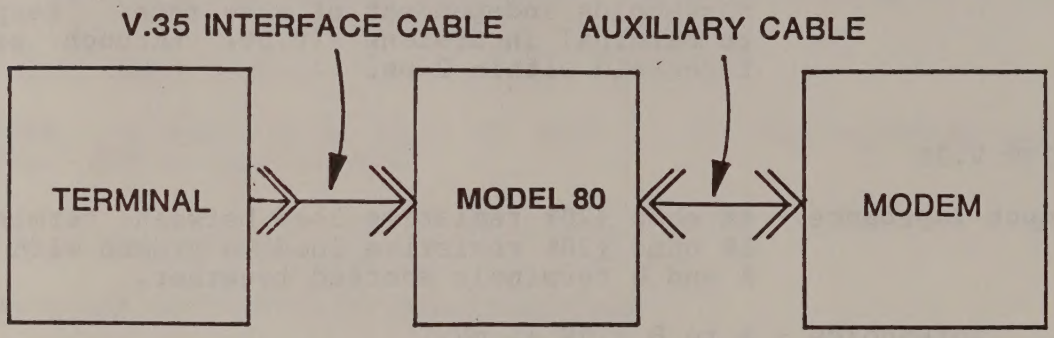

FIGURE 1-2. MODEL 80 MONITORING MODEM-TERMINAL INTERFACE

2.0 OPERATION

2.1 General

This section provides information on the various capabilities of the Model 80. Each major function, as defined by the borders on the front panel, is described below.

A Modem-Terminal interface decal, located on the inside cover of the unit, shows the CCITT V.35 pin assignments, signal levels, and signal flow. This decal will assist the operator in the various testing and fault analysis procedures. See Figure 2-1.

2.2 Breakout and Monitor Section

The Breakout and Monitor section is situated in the center of the front panel (see Figure 2-2). When the modem (DCE) and terminal (DTE) are connected through the Model 80, all interface conductors specified in Bell Systems publication 51304 (Wideband Data Set 306-Type Interface Specifications) except Signal Ground and Frame Ground pass through this section. Signal Ground and Frame Ground are available on test pins in the lower left corner of the front panel and described in detail in Section 2.5.

The unspecified conductors (h, i, j, k, m, and n) are connected through the Model 80 but do not pass through the Breakout and Monitor section. The remaining conductors (L, M, N, X, b, c, d, f, and g) are not connected through the Model 80.

All EIA RS-232 lines (control signals) are located in the left half of the Breakout and Monitor section and are controlled by single pole MAKE/BREAK switches. The V.35 balanced lines (clock and data signals) are located in the right half of the section and are controlled by double pole MAKE/BREAK switches. These switches permit any of the signal conductors or pair of conductors to be opened. The male patch pins on the DCE and DTE sides of the MAKE/BREAK switches remain connected to the modem and terminal cables, respectively. Figures 2-3 and 2-4 show schematic diagrams of typical RS-232 and CCITT V.35 lines through a Model 80.

Each of the conductors passing through the MAKE/BREAK switches is senses and indicated on the LED of the driven side of its switch. High impedance voltage sensors are used for the RS-232 conductors on the left half of this section. Balanced receivers are used for the V.35 lines located on the right half. LED ON indicates a signal SPACE. A dim LED indicates either a static line at the sensor's threshold or data on the line up to 100 KHz. The LED will be off when the line is open.

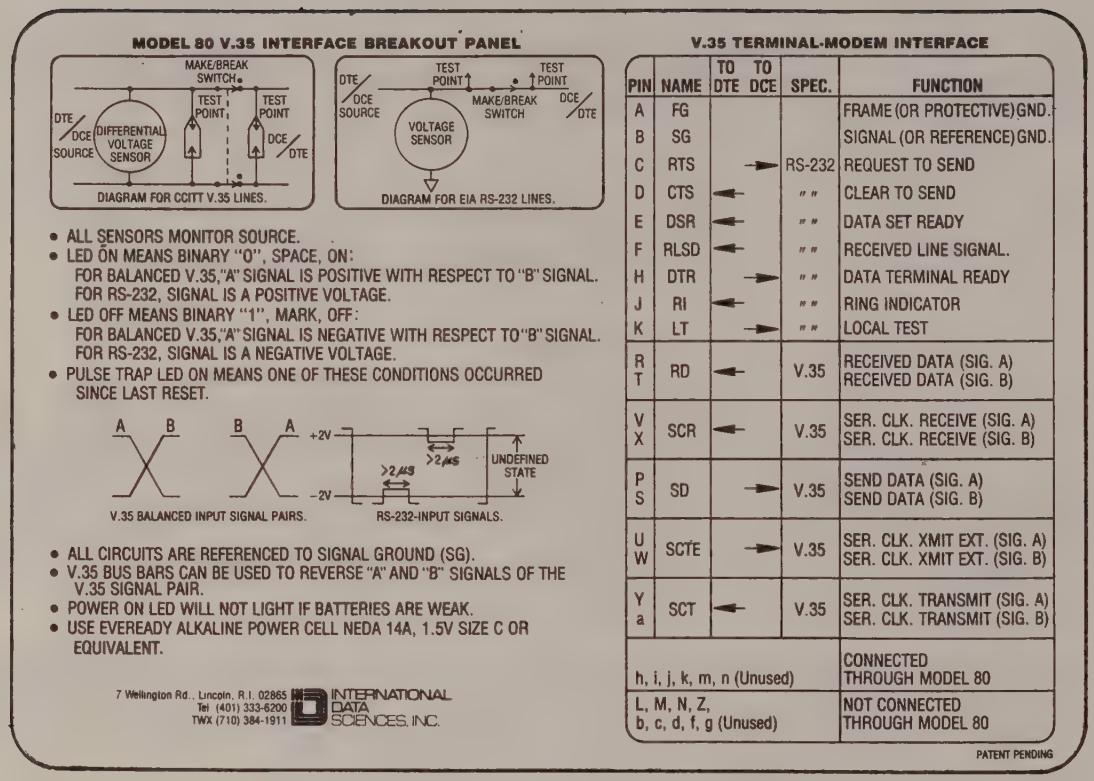
MODEL 80 V.35 INTERFACE BREAKOUT PANEL
MAKE/BREAK SWITCH
TEST POINT
TEST POINT
DTE
DCE
SOURCE
DIFFERENTIAL VOLTAGE SENSOR
DCE
DTE
DIAGRAM FOR CCITT V.35 LINES.
TEST POINT
TEST POINT
DTE
DCE
SOURCE
MAKE/BREAK SWITCH
DCE
DTE
VOLTAGE SENSOR
DIAGRAM FOR EIA RS-232 LINES.
• ALL SENSORS MONITOR SOURCE.
• LED ON MEANS BINARY "0", SPACE, ON:
FOR BALANCED V.35,"A" SIGNAL IS POSITIVE WITH RESPECT TO "B" SIGNAL.
FOR RS-232, SIGNAL IS A POSITIVE VOLTAGE.
• LED OFF MEANS BINARY "1", MARK, OFF:
FOR BALANCED V.35,"A" SIGNAL IS NEGATIVE WITH RESPECT TO "B" SIGNAL.
FOR RS-232, SIGNAL IS A NEGATIVE VOLTAGE.
• PULSE TRAP LED ON MEANS ONE OF THESE CONDITIONS OCCURRED SINCE LAST RESET.
A
B
B
A
V.35 BALANCED INPUT SIGNAL PAIRS.
+2V
-2V
>2 μs
>2 μs
UNDEFINED STATE
RS-232-INPUT SIGNALS.
• ALL CIRCUITS ARE REFERENCED TO SIGNAL GROUND (SG).
• V.35 BUS BARS CAN BE USED TO REVERSE "A" AND "B" SIGNALS OF THE V.35 SIGNAL PAIR.
• POWER ON LED WILL NOT LIGHT IF BATTERIES ARE WEAK.
• USE EVEREADY ALKALINE POWER CELL NEDA 14A, 1.5V SIZE C OR EQUIVALENT.
7 Wellington Rd., Lincoln, R.I. 02865
Tel (401) 333-6200
TWX (710) 384-1911
INTERNATIONAL DATA SCIENCES, INC.
V.35 TERMINAL-MODEM INTERFACE
PIN
NAME
TO DTE
TO DCE
SPEC.
FUNCTION
A FG FRAME (OR PROTECTIVE) GND.
B SG SIGNAL (OR REFERENCE) GND.
C RTS RS-232 REQUEST TO SEND
D CTS " " CLEAR TO SEND
E DSR " " DATA SET READY
F RLSD " " RECEIVED LINE SIGNAL.
H DTR " " DATA TERMINAL READY
J RI " " RING INDICATOR
K LT " " LOCAL TEST
R T RD V.35 RECEIVED DATA (SIG. A) RECEIVED DATA (SIG. B)
V X SCR V.35 SER. CLK. RECEIVE (SIG. A) SER. CLK. RECEIVE (SIG. B)
P S SD V.35 SEND DATA (SIG. A) SEND DATA (SIG. B)
U W SCTE V.35 SER. CLK. XMIT EXT. (SIG. A) SER. CLK. XMIT EXT. (SIG. B)
Y a SCT V.35 SER. CLK. TRANSMIT (SIG. A) SER. CLK. TRANSMIT (SIG. B)
h, i, j, k, m, n (Unused) CONNECTED THROUGH MODEL 80
L, M, N, Z, b, c, d, f, g (Unused) NOT CONNECTED THROUGH MODEL 80
PATENT PENDING

FIGURE 2-1. MODEL 80 V.35 MODEM-TERMINAL INTERFACE DECAL

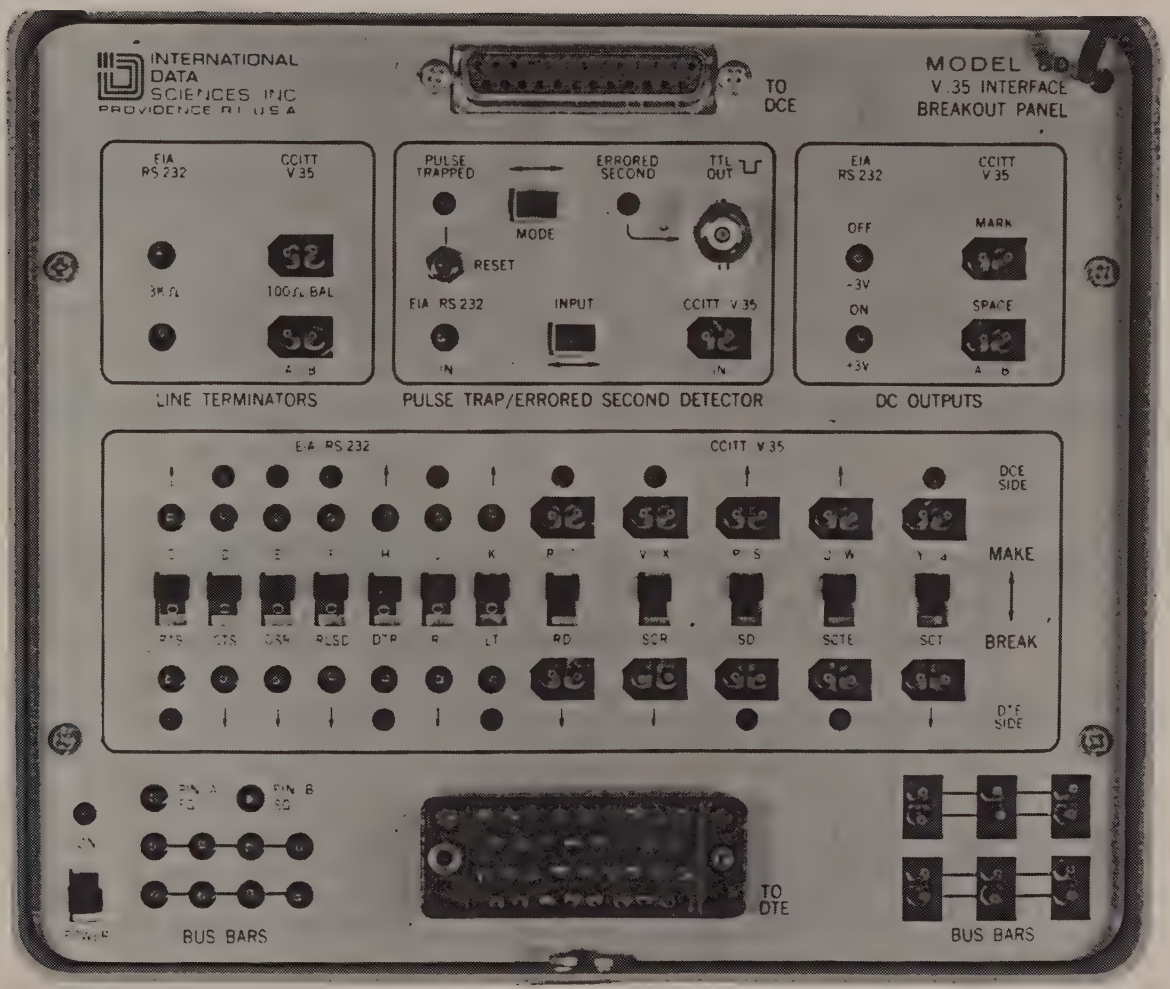

FIGURE 2-2. MODEL 80 FRONT PANEL

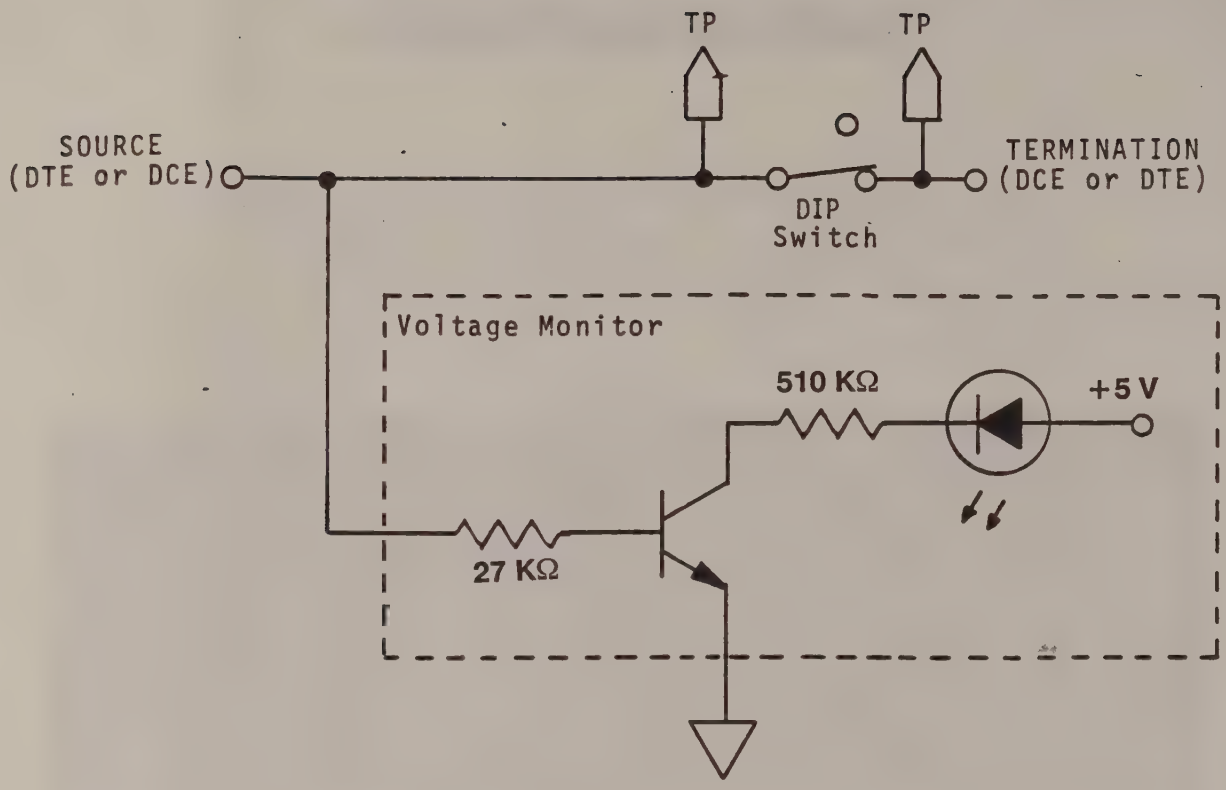

FIGURE 2-3. SCHEMATIC OF TYPICAL EIA RS-232 LINE THROUGH MODEL 80

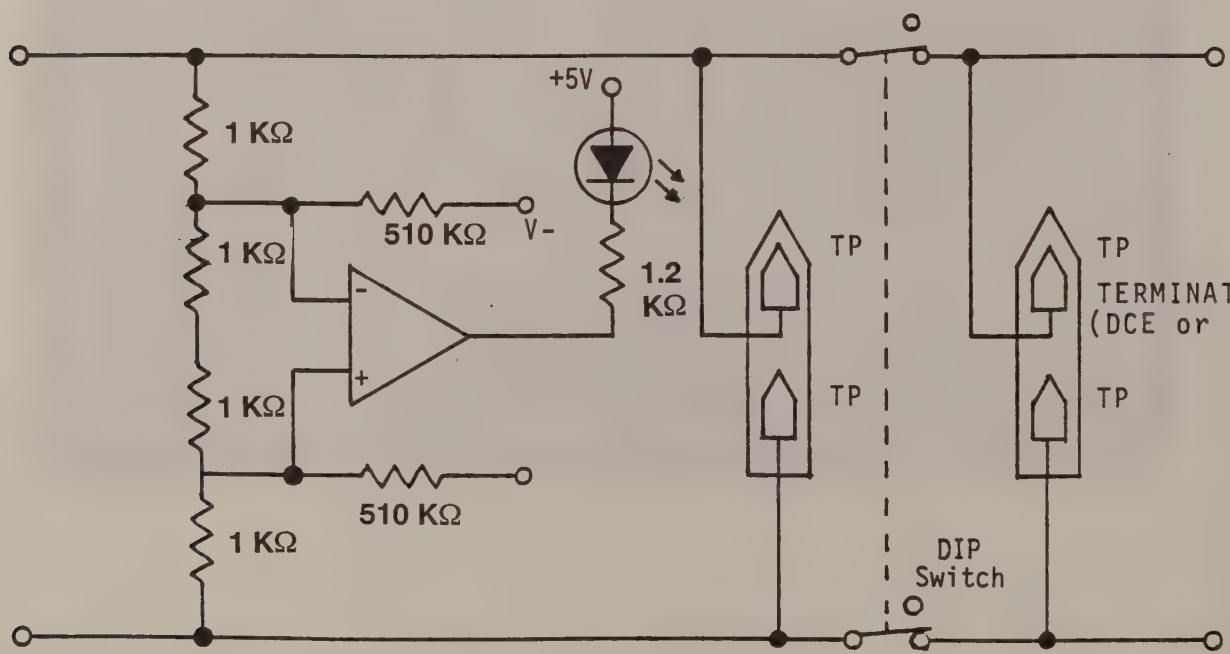

FIGURE 2-4. SCHEMATIC OF TYPICAL V.35 LINE THROUGH MODEL 80

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(401) 333-6200 TWX: 710-384-1911

2.3 Line Terminators Section

This section in the upper left of the panel includes two EIA RS-232 line terminators and two V.35 line terminators (refer to Figure 2-2). The 3K ohm RS-232 terminators can be used to place the maximum permissible receiver load on an RS-232 driver. The V.35 line terminators should be used whenever a line is monitored without being terminated at its destination (when the MAKE/BREAK switch is open). Figure 2-5 shows a schematic diagram of the line terminators.

2.4 Pulse Trap/Errored-Second Detector Section

Two separate test functions, selectable through the use of the MODE switch, are located in the top center of the Model 80 front panel. These functions are PULSE TRAP or ERRORED SECOND DETECTOR.

2.4.1 Pulse Trap

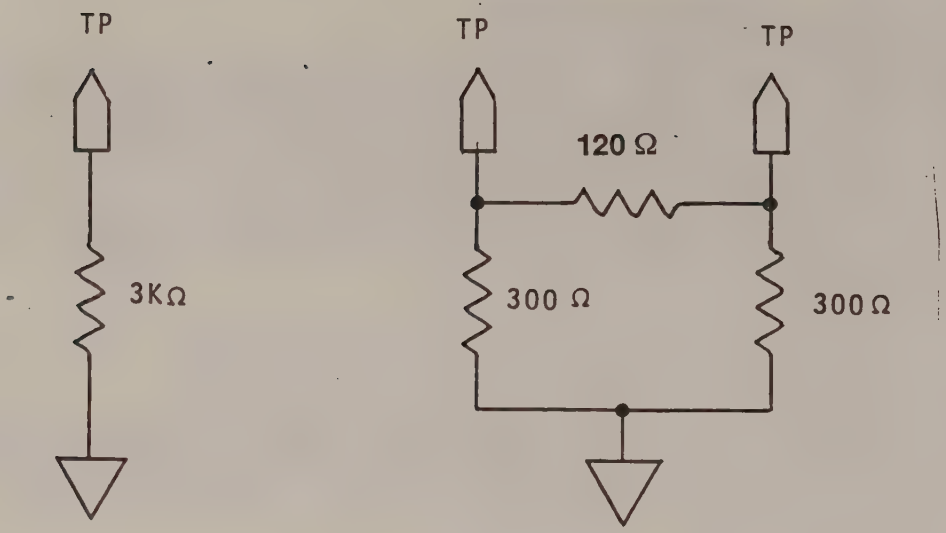
To use the Pulse Trap, put the MODE switch in the left-hand position, patch either the RS-232 or V.35 IN jack to a properly terminated line, and switch INPUT to the desired position. See Figure 2-2. Figure 2-6 shows the Model 80 PULSE TRAP function monitoring an RS-232 or V.35 line.

Once the pulse trap is set-up, it can be reset (returning the LED to the OFF state) by pressing the RESET button while the voltage being sensed by the RS-232 input is outside that part of the "undefined" zone (indicated in Figure 2-7) or while the balanced V.35 input changes state. This depends upon the input selected.

Once such a line transient has occurred, it is the function of the pulse trap to "remember" it indefinitely. The PULSE TRAPPED LED will remain ON until it is reset again through the use of the RESET button.

Please note that the RS-232 and V.35 inputs are treated differently in the Model 80 design. The EIA RS-232 specification identifies a dead zone between a mark and a space within which the line state is "undefined", i.e., it is neither a mark nor a space. A line operating with voltage transgressions into this undefined zone is operating marginally and may cause receiver state changes depending on the switching threshold of the particular receiver. When the pulse trap is used with the RS-232 input, the trap will set whenever the voltage sufficiently enters this zone.

The CCITT V.35 specification defines a balanced line which is marking if Terminal B is 0.55V positive with respect to Terminal A and spacing when Terminal A is 0.55V positive with respect to Terminal B. When the V.35 input is used, the trap will set whenever the more negative terminal becomes the more positive terminal. A single switching threshold is used at A-B = 0V.



RS-232-C LINE TERMINATORS V.35 LINE TERMINATORS

FIGURE 2-5. SCHEMATIC DIAGRAM OF LINE TERMINATORS

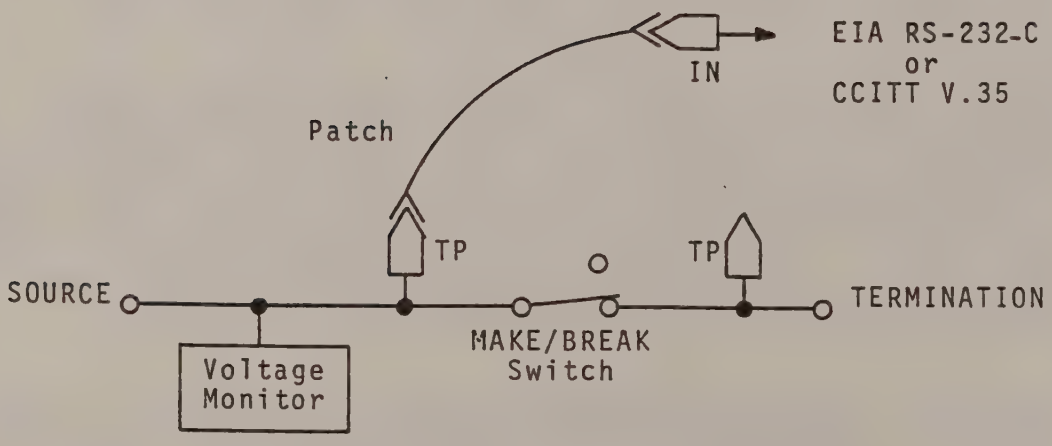


FIGURE 2-6. PULSE TRAP MONITORING LINE

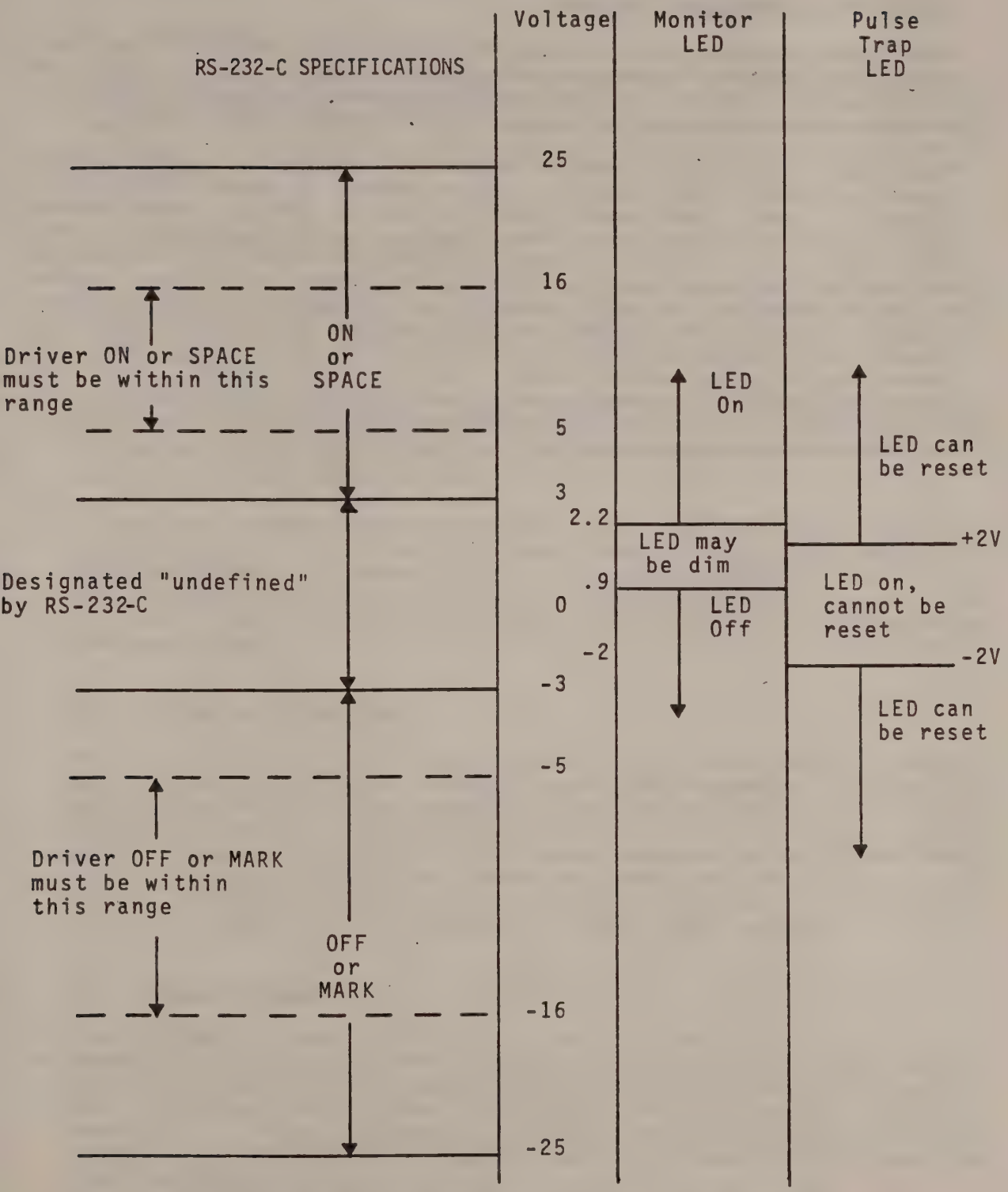


FIGURE 2-7. VOLTAGE THRESHOLDS FOR RS-232 LINES

2.4.2 Errored-Second Detector

This test function of the Model 80 allows the operator to perform three Errored-Second tests on high-speed lines without the use of a bit error test set. A standard lab counter or an IDS Data Test Set Printer may be used to calculate and record test results.

This test is possible because of the utilization of pseudo-random number generators and decoders in the modem. To maintain synchronization, most high-speed modems modulate a pseudo-random number bit sequence with the data. This is done so as to spread the energy over the available bandwidth and to ensure bit transition during long marks or spaces. If the SEND DATA line of one modem is held marking, it will transmit a true pseudo-random sequence which will be decoded in the receiving modem as a steady mark. Any transitions on the RECEIVE DATA line of the receiving modem will correspond to information losses in the data link. The ERRORED-SECOND DETECTOR groups these transitions by time, pulses the TTL OUT BNC, and flashes the ERRORED-SECOND LED once for each second that contains any transitions. See Figure 2-8.

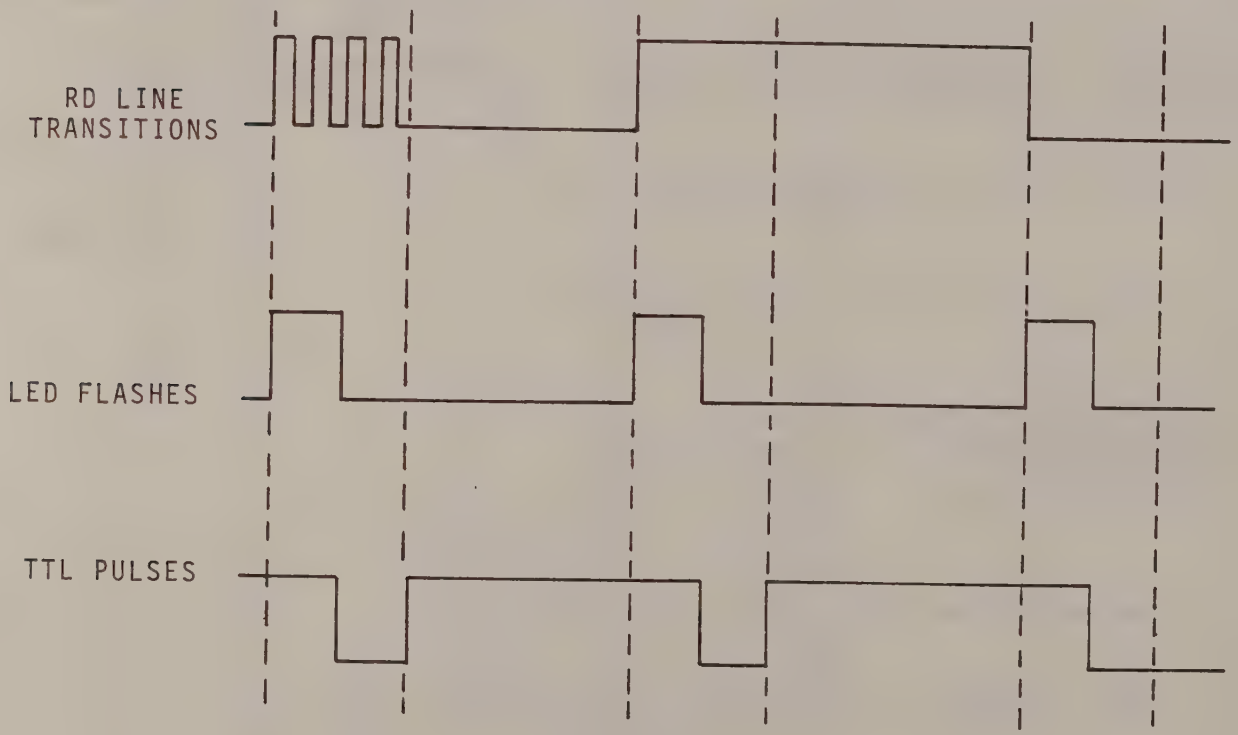


FIGURE 2-8. ERRORED-SECOND DETECTOR WAVESHAPE

2.7 Bus Bars

There are two sets of bus bars to serve as tie points in complex patch arrangements. The group in the lower left is for EIA RS-232 patching. The CCITT V.35 group in the lower right serves the function of patching tie points as well as reversing the A and B terminals.

2.8 Power Switch and ON LED

The POWER switch allows the operator to connect or disconnect the battery source from the Model 80 circuits while the cover is open. It is connected in series with an internal switch which automatically removes battery power when the cover is closed.

The ON LED is driven by a circuit which monitors the battery voltage. It will be ON whenever the Model 80 is ON - provided the batteries have a sufficient level of charge to ensure satisfactory operation of all Model 80 circuits.

To use the ERRORED-SECOND DETECTOR, patch the V.35 or RS-232 input as was done for the pulse trap test. Switch the MODE switch to ERRORED-SECOND. Connect a counter or printer to the TTL OUT BNC for a predetermined period of time and calculate the errored seconds/unit time ratio.. For a short test, count the flashes on the errored-second LED.

2.5 DC Outputs Section

This function in the upper right of the front panel is used to bias a line to the Mark (OFF) or Space (ON) condition. These outputs have source impedances in accordance with the appropriate specifications, but the EIA RS-232 outputs use the battery voltages available (+3V and -3V). These levels are less than RS-232 specifications, particularly when the batteries are not at full charge. While they provide a convenient source of line bias for most uses, they could be marginal in some applications.

2.6 Ground Points

Two ground points are available on the test points in the lower left of the panel above the BUS BARS. Pin A is the Frame Ground connected between equipment on Pin A of the interface connector. Pin B is Signal Ground and is connected to Pin B of the interface connector. Signal Ground is used as the reference for all circuits in the Model 80. Signal Ground and Frame Ground are not tied together.

3.0 APPLICATIONS

In this section, several common applications of the Model 80 are described.

3.1 Monitoring the Modem/Terminal Interface

SET-UP: See Figure 3-1.

a) Disconnect the interface cable from the modem and plug it into the "To DTE" connector on the Model 80.

b) Use the auxiliary cable (stored in the cover) to connect the modem to the Model 80's DCE connector.

c) Switch all MAKE/BREAK switches to the MAKE position.

Now the Model 80 is transparent to the interface, while at the same time allowing the operator to monitor the state of each signal conductor on the 12 LEDs. The position of the LED on the panel indicates the direction of information flow at a glance. The LED is on the source side of the switch. The arrows indicate the direction of information flow.

To discern which end of a "bad" line is at fault, the Model 80 can be used to replace a line terminator by breaking the line at the MAKE/BREAK switch and patching a terminator to the patch point on the driver side of the switch. It can also replace a driver by patching a Model 80 DC output to the patch pin on the receiver side of the open switch.

A line can be checked for spurious transitions by patching the PULSE TRAP onto that line.

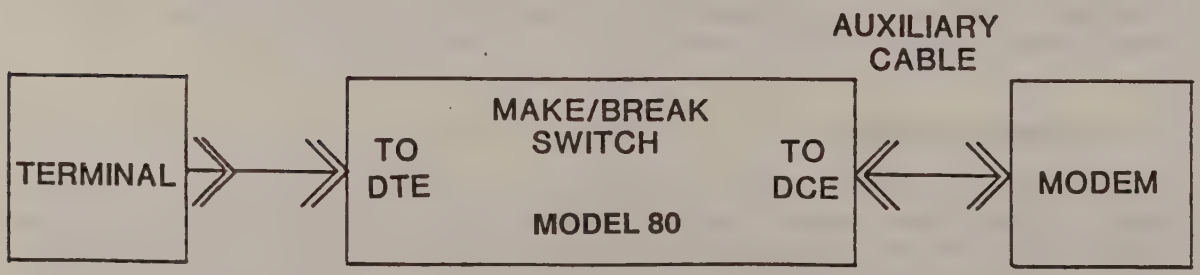


FIGURE 3-1. MODEL 80 MONITORING MODEM/TERMINAL INTERFACE

3.2 Testing an Isolated Modem or Terminal

SET-UP: See Figure 3-2.

a) Use the auxiliary cable stored in the cover to connect a modem to the Model 80 "DCE" connector. Use a terminal-to-modem cable to connect a terminal to the Model 80 "DTE" connector.

b) Terminate all lines with the ALL TERMINATED switch. Terminate each output line as it is tested with the Model 80 line terminators.

c) Device output lines can be monitored on the Model 80 LEDs. Input lines can be driven by the Model 80 DC outputs.

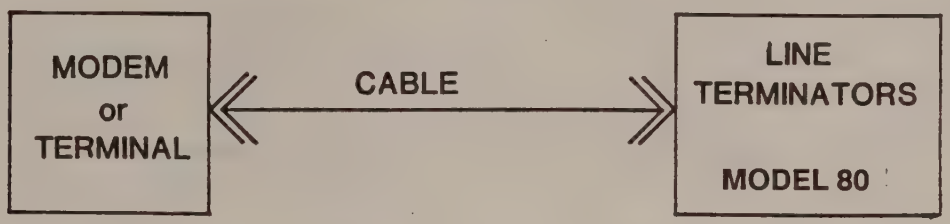


FIGURE 3-2. MODEL 80 TESTING AN OFF-LINE MODEM OR TERMINAL

3.3 Using the Model 80 as a System (Errored-Second) Monitor

This test determines the Errored-Second Rate for a data link (Total Errored-Seconds/Total Elapsed Seconds = Errored-Second Rate). It takes advantage of the existing pseudo-random generators and decoders in some wideband modems. This test cannot be run on data links which use modems without pseudo-random generators.

SET-UP: See Figure 3-3.

a) Set-up the transmitting modem to transmit a steady mark or space. A Model 80 can serve this purpose.

b) Connect a Model 80 to the receiving modem to detect errored seconds on the RD line.

c) Connect a counter or printer to the TTL OUT BNC to record total errored-seconds accumulated.

d) Time the test and calculate the errored-second ratio from the above mentioned formula.

e) For a full-duplex test on a data link, the modem at point B is looped around while a Model 80 is used to control the SEND DATA line and monitor the RECEIVE DATA line on the modem at point A.

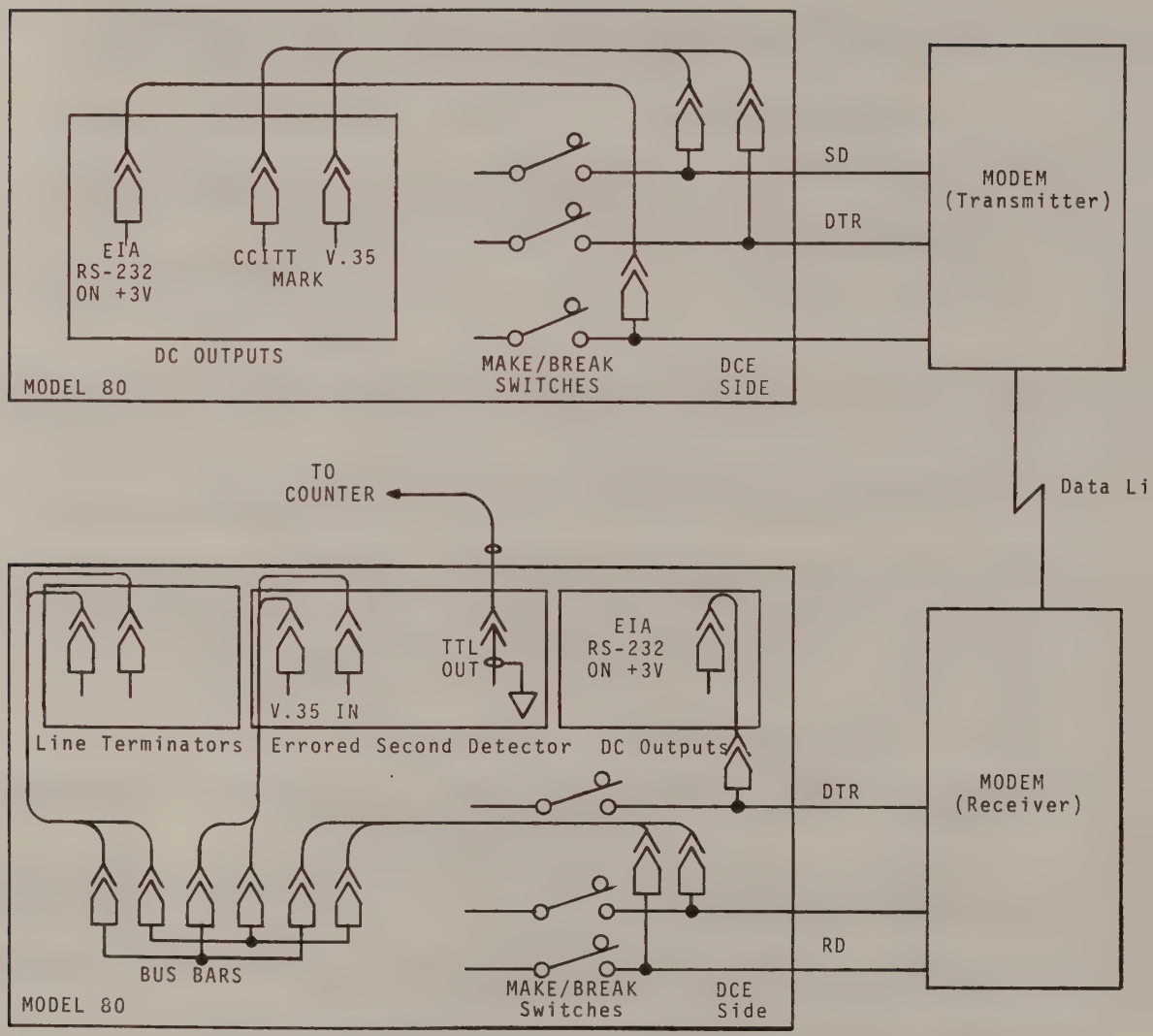


FIGURE 3-3. ERRORED-SECOND TEST

3.4 Testing a Cable

The Model 80 can be used to field test cables for opens and shorts.

SET-UP: See Figure 3-4.

a) Connect the Model 80 auxiliary cable to the DCE connector on the panel.

b) Connect the cable to be tested between the Model 80's DTE connector and its auxiliary cable.

c) Place the twelve MAKE/BREAK switches in the BREAK position.

d) Use the DC OUTPUTS to exercise each line in succession by patching it to the patch point on the side of the MAKE/BREAK switch which has no LED. If the line is good, the appropriate LED will light when the patch is made. Use the RS-232 +3V patch pin as a source for the RS-232 lines. The test is limited to those conductors of the cable which are connected to the pins indicated on the breakout and monitor section of the Model 80.

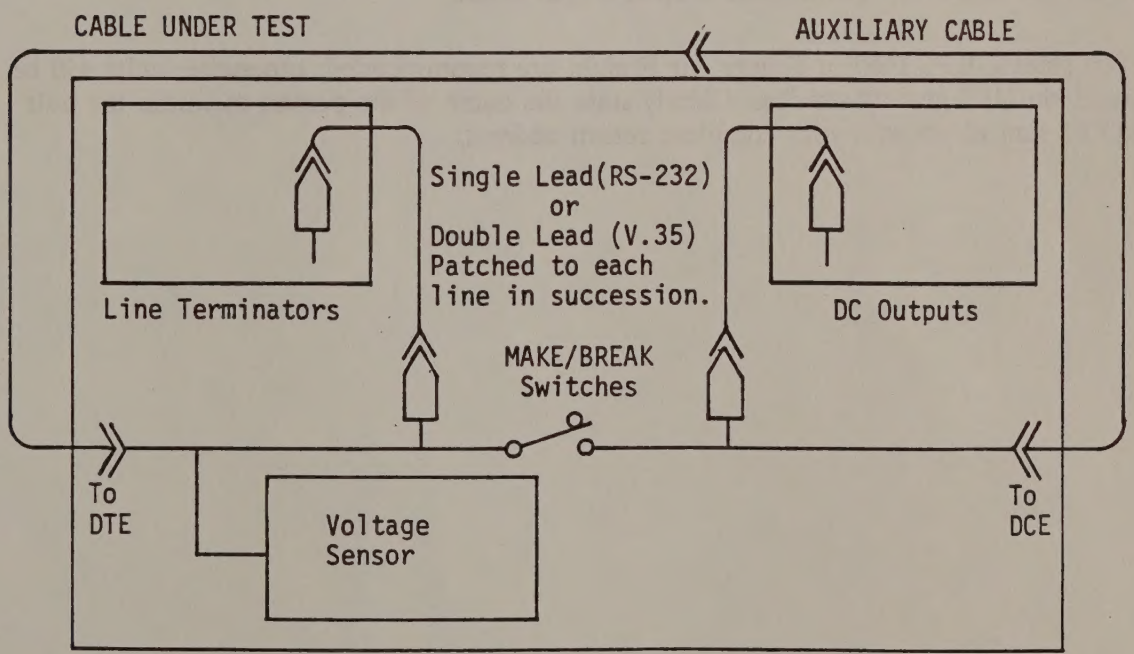


FIGURE 3-4. CABLE TEST

WARRANTY

All International Data Sciences, Inc., products are warranted against defects in material, workmanship, and component failure for one year from date of purchase unless noted otherwise. The Model 80 has a Three (3) Year Warranty. All units repaired by IDS are warranted for 90 days following the repair service.

This warranty does not apply if the equipment has been damaged by accident, neglect, misuse, or causes other than ordinary use, or as a result of service or modification other than performed or authorized by IDS.

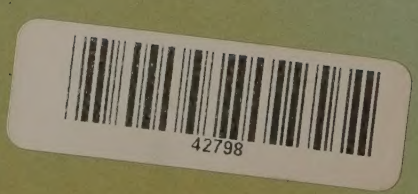
REPAIR SERVICE

Should your unit require repairs not covered by the original warranty, IDS will perform the repair at an hourly charge plus parts. Normal turn-around time is two weeks.

Prior to shipping your unit, contact IDS at 1-800-IDS-DATA for a Return Authorization (RA) number. All units returned to IDS for repair will be accepted only if transportation charges are prepaid. The purchaser is responsible for all transportation charges incurred in the return of the repaired unit. For out-of-warranty units, please include a purchase order.

Units for repair should be sent to International Data Sciences, Inc., 501 Jefferson Boulevard, Warwick, RI 02886-1317, Attention: Repair Department.

For fast return, UPS Red or Emery Air Freight are recommended; otherwise, units will be returned via UPS ground service. Clearly state the name of the person to whom the unit should be sent along with your complete return address.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